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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/537,954	06/08/2005	Gunnar Hultquist	1026-0002WOUS	5447

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EXAMINER	
PALABRICA, RICARDO J	
ART UNIT	PAPER NUMBER
3663	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/537,954	HULTQUIST ET AL.	
	Examiner	Art Unit	
	Rick Palabrica	3663	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *15-29* is/are pending in the application.

4a) Of the above claim(s) *19-22 and 26-29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *15-18 and 23-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7/15/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's 2/16/07 election with traverse of Invention I (product), species B (zirconium-based alloy), and subspecies C, with claims 15-18 and 23-25 readable thereon, is acknowledged.

2. Applicant argues that the plurality of claimed inventions cannot be restricted because "common inventive features are contained in both the product claims and in the method claims." The examiner disagrees.

First, the application was filed under 35 U.S.C. 371. Groups I and II, which are listed in the 1/19/07 Office action, do not relate to a single general inventive concept under PCT Rule 13.1, because under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the general inventive concept set forth, for example, in claims such as claim 15, does not define over the teachings of the prior art set forth, for example, in Ferrari (U.S. 3,677,894). Thus, notwithstanding the common inventive features alleged by the applicant, there exists no special technical feature that each of the inventions makes over the prior art. Therefore, there is lack of unity of invention and the groups are restrictable.

Second, the combination of categories of the claimed invention does match one of the permitted combinations. For example, there are two distinct products claimed in the product category; namely a nuclear fuel rod fro a boiling water reactor type AND a

a nuclear fuel rod for a pressurized water reactor type. Only one invention in each category is permitted.

The restriction requirement is still deemed proper and is therefore made **FINAL**.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 15-18 and 23-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 15 and 25 recite the limitation, "the internal pressure (P_{fill}) of the fill gas in the nuclear fuel rod amounts to at least about 2 bar (abs) at room temperature (T_R) and the proportion of carbon monoxide is at least about 3 volume per cent of the fill gas." There is neither an adequate description nor enabling disclosure of what all is meant by and encompassed by the term or phrase "at least about."

4. Claims 15-18 and 23-25 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims are vague, indefinite and incomplete, and its metes and bounds cannot be determined, particularly in regard to the phrase "at least about." It is not known what all is meant by or encompassed by this phrase. See section 3 above.

As to claim 15, the addition of the word "type" extends the scope of the expression as to render it indefinite. See MPEP 2173.05(b) and *Ex parte Copenhaver*, 109 USPQ 118 (Bd. App. 1955). Likewise the phrase " boiling water - type" is indefinite because it is unclear what "type" is intended to convey.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims15-18 and 23-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Ferrari (U.S. 3,677,894), who discloses a nuclear fuel rod for a reactor (e.g. see Figs. 1 and 2, and col. 2, lines 71+).

Ferrari discloses: a) a cladding 14 of zirconium-base alloy (see col. 4, lines 46+); b) a plurality of nuclear fuel pellets 12; c) a fill gas of at least 200 psi at 25° C to withstand external pressure (see col. 3, lines 31+); d) a decomposable compound 24

that generates carbon monoxide (see col. 3, lines 73+ and col. 4, lines 44+); e) helium fill gas (see col. 6, lines 52+).

As to the claimed proportions of carbon monoxide in claims 15-18, Ferrari meets these limitations either at the time of manufacture of the fuel rod or during the course of the use of said rod in a nuclear power reactor. A fuel rod is inherently assembled with other rods to form a fuel assembly that is loaded in a reactor to produce power during operation. Ferrari discloses that decomposable compound 24 produces carbon monoxide in a temperature range of 200°-600° F (see col. 4, lines 12+). This decomposition temperature is below the temperature of the annular space between the pellet and the inner surface of the fuel rod cladding during reactor operation, which is between 780° F and 1100° F. Thus, carbon monoxide continues to be generated during reactor operation, and its content relative to the fill gas continuously increases to meet or exceed the recited proportions.

Note that the same proportion in independent claim 15 encompasses the recited proportions of carbon monoxide in dependent claims 16-18. As to Ferrari meeting the limitation of these claims, see MPEP 2131.03, which states:

> "[W]hen, as by a recitation of ranges or otherwise, a claim covers several compositions, the claim is 'anticipated' if one of them is in the prior art." *Titanium Metals Corp. v. Banner;* 778 F.2d 775, 227 USPQ 773.

As to claim 23, applicant has not defined when the inner surface of the cladding is so-called pre-oxidized. Absent such definition, the examiner interprets the term broadly at reads the pre-oxidation during the initial internal gas pressurization when thermally decomposable body 24 is heated (see col. 6, lines 10+). Such heating

inherently oxidizes the inner surface of the rod cladding. Again, applicant has not defined the degree of oxidation, and absent such definition, the examiner reads the claim limitation on the oxidation during the carbon monoxide generation in Ferrari.

As to claim 25 and the recited nuclear fuel assembly comprising a plurality of nuclear fuel rods, as stated above, the rods in Ferrari are inherently used to form a nuclear fuel assembly.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims15-18 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over by Ferrari.

In section 5 above, the examiner stated that the claimed proportion of carbon monoxide relative to the fill gas is inherent in Ferrari. If this is not evident or if the applicant has a different opinion, the claims still do not define over Ferrari.

Ferrari teaches a fuel rod wherein an inert gas is included with a thermally decomposable compound that generates carbon monoxide (see col. 6, lines 44+). The combination of the inert gas and carbon monoxide comprise the fill gas, and the proportion of carbon monoxide to the fill gas is a matter of design choice and/or optimization within prior art conditions or through routine experimentation (see MPEP

2144.05 II.A). For example, said proportion depends on design specifications for the fuel rod, including the pressure and temperature that it must withstand during reactor operation, the exact length and diameter of the rod, the configuration of the fuel assembly where the rod is used, etc. Alternatively, said proportion is a matter of optimization, i.e., finding the optimum ratio of carbon monoxide to fill gas that achieves the desired objective of achieving high neutron economy without unduly straining the cladding (see col. 3, lines 1+).

7. Claims 15-18 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rudling et al. (2001/0019597) in view of either one of Marechal et al. (U.S. 4,957,696) or Ferrari. Rudling et al. disclose the applicant's claim limitations except for the internal pressure of the fill gas.

Rudling et al. teaches a nuclear fuel rod designed to provide protection against H_2 permeation (see paragraph 0012). The rod comprises: a) a cladding 1 of zirconium alloy (see paragraph 0019); b) a plurality of nuclear fuel pellets 2; and c) a fill gas of helium (see claim 13) and carbon monoxide (see claim 19). Rudling et al. teaches a pre-oxidation with zirconium oxide (see paragraph 0019).

Either one of Marechal et al. or Ferrari teach the fill gas in a nuclear rod to have a the claimed pressure to withstand external pressure (e.g., see col. 1, lines 34+ in Marechal).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus, as disclosed by Rudling et al.,

by the teaching of either one of Marechal et al. or Ferrari, to pressurize the fill gas to the claimed value, to gain the advantages thereof (i.e., prevent rod deformation), because such modification is no more than the use of a well known expedient within the nuclear art.

With regard to the proportion of carbon monoxide to the fill gas in the claims, again this is a matter of design choice and/or optimization within prior art conditions or through routine experimentation (see MPEP 2144.05 II.A). For example, said proportion depends on design specifications for the fuel rod, including the pressure and temperature that it must withstand during reactor operation, the exact length and diameter of the rod, the configuration of the fuel assembly where the rod is used, etc. Alternatively, said proportion is a matter of optimization, i.e., finding the optimum ratio of carbon monoxide to fill gas that achieves maximum protection against H_2 permeation at a minimum cost.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Palabrica whose telephone number is 571-272-6880. The examiner can normally be reached on 6:00-4:30, Mon-Thurs.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on 571-272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RJP
March 8, 2007

RPalabrica

RICARDO J. PALABRICA
PRIMARY EXAMINER